CLAIMS:

We Claim:

1. A method for determining the location of an object in a passenger compartment of a vehicle, comprising the steps of:

transmitting ultrasonic waves from a first transducer into the passenger compartment;

receiving waves reflected off an object in the passenger compartment by means of the first transducer;

calculating a first distance from the first transducer to the object based on the time difference between the transmitted waves and reflected waves when received by the first transducer;

transmitting different ultrasonic waves from a second transducer into the passenger compartment;

receiving waves reflected off the object in the passenger compartment by means of the second transducer;

calculating a second distance from the second transducer to the object based on the time difference between the transmitted waves and reflected waves when received by the second transducer; and

determining an approximate location of the object in the passenger compartment based on the first distance and the second distance.

2. The method of claim 1, further comprising the steps of:

transmitting different ultrasonic waves from a third transducer into the passenger compartment;

receiving waves reflected off the object in the passenger compartment by means of the third transducer;

calculating a third distance from the third transducer to the object based on the time difference between the transmitted waves and reflected waves when received by the third transducer; and

determining the approximate location of the object in the passenger compartment based on the first distance, the second distance and the third distance.

3. The method of claim 2, further comprising the steps of:

transmitting different ultrasonic waves from a fourth transducer into the passenger compartment;

receiving waves reflected off the object in the passenger compartment by means of the fourth transducer;

calculating a fourth distance from the fourth transducer to the object based on the time difference between the transmitted waves and reflected waves when received by the fourth transducer; and

determining the approximate location of the object in the passenger compartment based on the first distance, the second distance, the third distance and the fourth distance.

4 The method of claim 1 wherein said first and second distance calculation steps each comprise the step of using waves reflected from multiple locations on the object .

5 The method of claim 4, wherein said first and second distance calculation steps each further comprises the step of employing pattern recognition techniques based on the time distribution of the echo pattern of the reflected waves.

6 The method of claim 5, wherein said step of employing pattern recognition techniques comprises the step of generating an algorithm by means of a neural network computer program.

7. The method of claim 1, further comprising the steps of:

identifying a volume within the passenger compartment adjacent the airbag where occupancy by a human at the time of airbag deployment would place the human in danger;

identifying a second volume within the passenger compartment where occupancy by a human requires deployment of an airbag in a sufficiently severe vehicle crash;

defining a first axis connecting the centers of the first and second volumes; and

positioning the first transducer and the second transducer so that they lie on a second axis which is approximately parallel to said first axis.

8. The method of claim 1, further comprising the steps of:

positioning the first transducer on a the ceiling of the vehicle, and

positioning the second transducer on a dashboard of the vehicle.

9. The method of claim 2, further comprising the steps of:

positioning the first transducer on a ceiling of the vehicle,

positioning the second transducer on a dashboard of the vehicle, and

positioning the third transducer on or adjacent an interior side surface of said passenger compartment.

10. The method of claim 3, further comprising the steps of:

positioning the first transducer on a ceiling of the vehicle,

positioning the second transducer on a dashboard of the vehicle,

positioning the third transducer on an interior side surface of said passenger compartment, and

positioning the fourth transducer on or adjacent an interior side surface of said passenger compartment.

11. A method for identifying an object in a passenger compartment, comprising the steps of:

mounting at least two ultrasonic transducers at different locations in the passenger compartment;

conducting training identification tests on a plurality of different classes of objects when situated in the passenger compartment, each of said tests comprising the steps of transmitting

ultrasonic waves from the first transducer into the passenger compartment, receiving waves reflected off the object by means of the first transducer, transmitting different ultrasonic waves from the second transducer into the passenger compartment, receiving waves reflected off the object by means of the second transducer, and associating an object class with data from each test,

generating a pattern recognition algorithm from the training test results and associated object classes such that the algorithm is able to process information from the reflected waves from the first and second transducers providing the identification of the class of the object;

transmitting ultrasonic waves from the first transducer into the passenger compartment when identification of an object in the passenger compartment is desired;

receiving waves reflected off the object by means of the first transducer;

transmitting different ultrasonic waves from the second transducer into the passenger compartment when identification of the object in the passenger compartment is desired;

receiving waves reflected off the object by means of the second transducer; and

applying the algorithm based on the first and second reflected waves to identify the object in the passenger compartment.

12. The method of claim 11, wherein said object class is a child seat in the rear facing position.

13. The method of claim 11, wherein said object class is an out-of-position occupant.

14. The method of claim 11, further comprising the step of normalizing the reflected waves .

15. The method of claim 11, further comprising the step of performing a system diagnosis by transmitting waves from the first transducer to the second transducer.

16. The method of claim 11, further comprising the step of recording the reflected waves for subsequent analysis of a vehicle event.

17. The method of claim 11, further comprising the step of providing an output from the system to control another vehicle system based on the identification results.

18. The method of claim 11, further comprising the step of combining at least two sets of reflected waves prior to their use in identifying an object.

19. The method of claim 17, further comprising the step of comparing at least two identification cycles before the output is provided to the another vehicle system.

20. The method of claim 11, further comprising the step of compensating for changes in the speed of sound.

21. The method of claim 11, further comprising the step of:

selecting the different classes of objects to be rear facing child seats, forward facing child set, adult passengers and infant passengers.

22. The method of claim 11, further comprising the steps of:

positioning the first transducer on a ceiling of the vehicle, and

positioning the second transducer on a dashboard of the vehicle.

23. A method for determining the location of an object in a passenger compartment of a vehicle, comprising the steps of:

mounting at least three receivers at different locations in the passenger compartment each receiver comprising distance measurement means;

providing a source of illumination;

calculating a first distance from the first receiver to the object based on the output of the first receiver;

calculating a second distance from the second receiver to the object based on the output of the second receiver;

calculating a third distance from the third receiver to the object based on the output of the third receiver; and

determining an approximate location of the object in the passenger compartment based on the first distance, the second distance and the third distance.

24. The method of claim 23, wherein said receivers receive ultrasonic radiation.

25. The method of claim 23, wherein said receivers receive electromagnetic radiation.

26. The method of claim 23, further comprising the steps of:

mounting a fourth receiver at a different location in the passenger compartment, said fourth receiver comprising distance measurement means,

calculating a fourth distance from the fourth receiver to the object based on the output of the fourth receiver,

determining an approximate location of the object in the passenger compartment based on the first distance, the second distance, the third distance and the fourth distance calculating a third distance from the third receiver to the object based on the output of the third receiver.